EUROPEAN PARLIAMENT

Science and Technology Options Assessment

S T O A

Nanotechnology in the framework of Parliamentary Technology Assessment: OPECST, STOA and DBT case studies

NOTE

PE 393.535

The research reported in this note was conducted while the author was a trainee at the General Secretariat of the European Parliament in Brussels from September to December 2007. He was assigned to the Secretariat of STOA (Science and Technology Options Assessment) within the Policy Department for Economic and Scientific Policy, Directorate A, Directorate-General for Internal Policies.

Only published in English.

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Manuscript completed in February 2008

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1. Parliamentary Technology Assessment: a theoretical approach

To establish a unique definition of a Technology Assessment (TA) office is not an easy task, especially as many different organisations (agencies, non-governmental organisations, lobbies, universities or parliamentary committees) claim their activities to be TA-labelled because they provide information on science and technology issues.

Broadly speaking, we can say that Technology Assessment is one of the many ways by which a social entity, for instance a firm or an industry, may understand its own role, and thereby comprehend its future, and thus perhaps, to some extent, control that future. States have been using TA for a long time now. For some reasons governments were mostly, until fairly recently, able to keep the art, craft, or science of Technology Assessment in their own hands. But, beginning in the 70's, awareness arose in various countries that the executive was benefiting from superior information to drive measures through the legislature that the latter scarcely had time to understand or, conversely, was using its superior information to protect its inertia in not legislating (Vig and Paschen, 2000; vii-viii).

Hence, the parliamentary Technology Assessment was born, firstly in the United States (1972), as a "proud reaction" (Mironesco, 1997) of the US Congress members willing to rebalance the powers with regard to the executive. They wanted to benefit from their own sources of "objective" information in science and technology policies, in order to identify the unforeseen side-effects that come along with new technologies. The first parliamentary TA office to be born in Europe was in France (1983), but this institutional practice has also been rooted in many other European countries, like in Denmark (1986), the Netherlands (1986), the European Parliament (1987), the United Kingdom (1989), Germany (1990), Switzerland (1992) or Flanders (2000). Nonetheless, for a set of political, cultural and institutional reasons, some of the European TA offices took a radically different shape than the American TA office.

We suggest analysing how different the scientific advice called "Technology Assessment" and provided to members of Parliaments can be for different countries. We agree with L. Cruz Castro and L. Sanz-Menendez, on the fact that the nature of these unique information-production practices and their emergence phenomenon can only be understood within their institutional context. The institutional arrangements that govern Parliamentary Offices of Technology Assessment (POTAs) are key factors for explaining the depth and extension of the impact of their TA activities; therefore, if one wants to understand TA's impact in the political and social process, one must first understand and characterize the institutional and political context in which it takes place (Cruz-Castro and Sanz-Menéndez, 2004). However, in order to provide a reliable overview of TA as an institutional practice, other key factors should be taken into account, like the degree of inclusiveness of the actors in the various POTAs, the forms of participation used and, lastly, the very meaning of the participation within the POTAs.

Based on the institutional context of several TA offices as well as their methodologies, we suggest combining the theoretical frameworks of T. Petermann (2000), L. Cruz-Castro and L. Sanz-Menendez (2005), J. Van Eijndhoven (1997) and G. Bechmann (1996).

1.1. Focus on the institutional arrangements: instrumental and discursive TA

Petermann (2000) roughly distinguishes two POTA models: an instrumental approach and a discursive one. The former emphasizes an understanding of TA as an expert-based analysis including options for policy-makers; the latter focuses on Technology Assessment as a means of fostering enlightened public debates on technologies.

Some other differences between the two approaches have to be underlined. In terms of its relationship with the Parliament, the instrumental POTA only provides expertise to the Parliament and its committees. The office is usually fully integrated within the Parliament. POTA's main mission is, in this case, the "enlightenment" of the members of Parliament.

In most cases, the instrumental model mainly uses scientific sources of information and is little sensitive to the opening of the TA process to lay expertise and to the general public.

By contrast, the discursive POTA has, as a core mission, to foster a social debate on scientific and technological issues too, in other words to work specifically on the social acceptability and understanding of technologies. It also serves the Parliament and its committees as main clients, but it sometimes advises the government as well. This type of TA organisation is usually more independent from the legislature.

1.2. Focus on the degree of inclusiveness of the actors: political, technocratic and social TA

However, it appears to us that this interesting typology of TA has to be completed by a second one developed by Cruz-Castro and Sanz-Menendez (2005). They present a pertinent objection to the distinction only between the instrumental and the discursive approaches. According to them, this labelling is partly misleading. Both types of POTAs are instrumental and the label discursive is not appropriate for describing a role of "supporting public debate". Those so-called "discursive" POTAs not only play an active part in promoting public debate, but are also instrumental for parliamentary debate. Along the same line, those labelled as instrumental, focusing their activities on the parliamentary debates, could also play, indirectly, the role of promoting public debate by raising the public's awareness of scientific and technological issues.

Hence, it becomes relevant to consider the degree of inclusiveness of different types of actors in the POTAs in the process of producing TA as well: politicians (parliamentarians), science and technology and policy experts, and the public. This can help identify three types of POTA, depending on the involvement and the role of the mentioned actors. The first one is the "political POTA" (politically inclusive) because, on a permanent basis, politicians (parliamentarians) play a relevant part, although they may ask for the collaboration of scientists and experts.

The second type is the "technocratic POTA" (expert inclusive) that involves, in addition to the politicians, a layer of permanent experts working for the Parliament and supporting the decision-making process with a prominent role.

The third one is the "social POTA" (socially inclusive) that involves an additional layer of social actors, mainly the public. This type of POTA is based on the key belief that the interaction between a broad range of stakeholders is necessary in conducting TA.

1.3. Focus on the forms of participation

Along with the degree of inclusiveness of the actors in the TA process, it has to be shown how differently the POTAs include participation at one stage or another. Josée Van Eijndhoven categorises four types of TA paradigms: the classic TA paradigm, the OTA paradigm, public TA and constructive TA (Van Eijndhoven, 1997).

The "classic TA paradigm" is limited to what the American OTA[1] first[2] achieved by building a TA fulfilling an early warning function by means of providing the parliamentarians with information on likely future effects of a technology. Due to theoretical considerations as well as for reasons of efficiency, some adjustment of this model shaped the so-called "OTA paradigm"[3] and its further European adaptations.

The "OTA paradigm" can be summarised as in-depth assessments leading to reports that provide a thoroughly informed analysis on a policy area in a scientific, non-partisan way, providing options for policy development, generated in a process involving stakeholders linked in particular ways to a legislative client (Van Eijndhoven, 1997).

[1] As mentioned above, the American Office of Technology Assessment has been the very first parliamentary TA office to be established. However, for some political reasons that will not be developed in this paper, it closed its doors in 1995.

[2] The first step of the office's development was strictly limited to this early warning function. Nonetheless, a second step has been made when, upon the base of the limitations of this initial approach of TA, the Americans developped a more elaborated way of scientific policy-consulting that became the base of the so-called "OTA paradigm".

[3] We can speak of an "OTA paradigm", especially because it was clear for a set of European actors willing to implement TA in their respective countries that it was worth duplicating in Europe what OTA was doing in the United States.

The Americans were involving an appreciable amount of external stakeholders to define the issue, elaborate a study plan and participate in a high-quality review system, both internal and external. According to M. Procter[4], these panels of "experts" were composed of at least two-thirds of non-academics, practical people involved in business, environmental action, labour unions. Such people are quick to sense an interesting but irrelevant topic that may be fun to study but is of no apparent use in policy-making.

A broad range of elements made impossible a duplication, in the strict sense, of OTA in Europe. Among these elements, we can mention the relative power of the European parliaments compared to the US Congress, the more strict separation of powers in the USA (in the UK for example, members of the government can be parliamentarians at the same time), the limited in-house analytical capacity of European offices and their relatively small budgets.

But in some countries, like Denmark and the Netherlands, other fundamental reasons have to be given to explain the particularity of their TA approaches. This is related to the role that TA is supposed to have in making the decision-making process more democratic, and to the developing research area of technology studies as a way of thinking about technological development (Van Eijndhoven, 1997). Here come the last two TA paradigms: the public and the constructive one.

In addition to the consideration of TA as an instrument of balancing the powers between the executive and the legislature, "public TA" is built on the premise that there is a usefulness in bridging the gap between experts, representatives and the lay public on science and technology issues. In this respect, TA practices are also dedicated to empowering democracy and to bringing together different stakeholders, including the general public, in order to broaden the base of the decision-making process and to foster a public debate by raising awareness on issues regarding the social implications of technologies. To do so, public POTAs use a large set of participatory methods, like the famous "consensus conference" (Joss and Bellucci, 2002; Slocum, 2003).

[4] Cited in Van Eijndhoven (1997).

The last paradigm refers to "constructive TA". Based on the limitations of the early-warning function of TA to forecast the side-effects of a technology, a constructive approach considers the technological development as a evolutionary dynamic process to be handled via the expertise of a TA office.

Constructive Technology Assessment (CTA) is a new design practice – including tools – in which possible impacts are anticipated and users and other impacted communities are involved from the start, in an interactive way that contains elements of social learning. As a result, CTA has a diffuse and emerging character, allowing each participant in the articulation process to emphasise a different aspect of the issue at hand. At the same time, however, there is a general recognition of the overall thrust of CTA: to broaden the design of new technologies (and to redesign old technologies). It is crucial to have feedback on TA activities flowing into the actual construction of technology, and strategies and tools contributing to such feedback can make up CTA[5]. Such strategies and tools can range from dialogue workshops and social experiments, to technology-forcing programmes and platforms. One can now speak of a paradigm of CTA to indicate the combination of the widely shared diagnosis as to the need for broadening of technical design and the exemplary experiences available (Rip and Schot, 1997).

In these two last paradigms (public and constructive), the emphasis is less on the production of authoritative reports than on social processes that may help shape technology in society: participation of a wider public (in public TA) or influencing technological development by taking wider considerations into account (in constructive TA) (Van Eijndhoven, 1997).

[5] The emphasis on construction explains why the development of CTA has been guided by (and was closely linked to) the development of technology studies. This is far less the case for other branches of the TA family that have been influenced by other disciplines and interdisciplinary fields. CTA needed a theory on technology dynamics for identifying feedback mechanisms. Conversely, research on CTA (feedback processes and use of tools) will help sharpen insights about technology dynamics (Rip and Schot, 1997)

Yet, even if the imperative of a successful and efficient participation is stressed by all the actors, there is a slight but meaningful difference between the interaction among stakeholders in order to improve the quality of the assessment, on the one hand, and the active participation of a wide range of stakeholders within the TA process, on the other. To put it differently, the participation does not have the same meaning everywhere.

1.4. Focus on the meaning of participation

Briefly, we suggest using Gotthard Bechmann's typology of participation (Bechmann, 1996). He distinguishes three models of the functioning of democracy: the "instrumental participation", the "elitist participation" and the "democratic participation". Consequently, the meaning of participation may change significantly depending upon the underlying model. In the instrumental participative model, participation may play the role of a consultative instrument in support of the representative decision-making mechanisms. In the elitist participative model, participation may have the function of disseminating information from scientific institutions to both politicians and the general public. Finally, in the democratic participative model, participation takes on a key function by giving the public at large a constitutional role in assessing science and technology.

2. From theory to practise: what is applicable to STOA, OPECST and DBT? The case of nanotechnology as an example

We suggest focusing mainly on three TA offices and positioning them within our theoretical framework. These three are the French Office parlementaire d'évaluation des choix scientifiques et techniques (OPECST), the European Parliament's Science and Technology Options Assessment (STOA) and the Danish Board of Technology (DBT). To consolidate our assessment, we will systematically use one (of the) report(s) that each office produced on the very specific case of nanotechnology.

For STOA, we use the report published in April 2007 and entitled "The Role of Nanotechnology in Chemical Substitution". The French report we consider is entitled "Nanosciences et progrès médical" and was published in May 2004. Lastly, the Danish study we use is one entitled "Citizen's Attitudes towards Nanotechnology" and published in November 2004. All three offices have worked on more that one report on nanotechnology, but we thought it would be sufficient to use those mentioned above in order to highlight how differently intelligence on nanotechnology can be provided in the framework of three major TA offices.

In summary, before going further into the details of the passage from theory to practise, our theoretical framework can be represented as follows:

1) Institutional arrangements	Instrumental TA			Discursive TA	
2) Inclusiveness of actors	-	Political TA	Technocratic TA	Social TA	
3) Form of participation	Classical TA	OTA paradigm	OTA paradigm	Public	Constructive
4) Meaning of participation	-	Instrumental	Elitist	Democratic	Democratic

From the institutional arrangements perspective, both OPECST and STOA practice instrumental TA, whereas we consider that DBT applies a discursive TA. Indeed, OPECST and STOA work for the respective parliaments and their committees as exclusive clients, and the intelligence they provide aims to "enlighten" the Members of Parliament in need of policy options. Both TA offices are fully integrated within their respective parliaments.

By contrast, DBT practices a discursive TA, because it is an independent body advising the Danish Parliament and Government. Moreover, it has the additional mission of fostering the public debate on new technologies, as well as improving the social understanding and acceptability of technologies.

Then, if we highlight the degree of inclusiveness of the actors, OPECST appears to be a political TA because of the active part played by the parliamentarians in the TA process. Definitely, the unique solution the French TA found for resolving the classic issue of readability of the reports was by increasing substantially the workload of the Members of Parliament concerned. Indeed, most of the time one or two MPs are in charge of a specific study. For each case, they involve an appreciable amount of external stakeholders to define the issue, elaborate a study plan and participate in a high-quality review system, both internal and external. That is what we identified above as "OTA paradigm" participation. The French particularity results from the fact that, after having been enlightened on the technological issue at stake in the report they are in charge of, the parliamentarians have to write the report themselves, once they are considered able to manage the overall issue and to transpose it into politically useful data.

By contrast, STOA does not practice a political TA but a technocratic one. There, the politicians (forming the STOA Panel) also play a significant part, but in addition there is a layer of experts working for STOA and having an important role in the TA process at the European level. In view of the growing importance of a European science and technology policy, the European Parliament decided to support STOA's activities by establishing permanent co-operation with a group of institutions with relevant expertise in the field of Technology Assessment. Since October 2005, a framework contract has been signed between the European Parliament and a framework contractor working via a network of scientific institutes, the European Technology Assessment Group (ETAG), to carry out TA studies on behalf of the STOA Panel. ETAG is composed of five European scientific institutes and has been providing scientific services for the European Parliament on social, environmental and economic aspects of new technological and scientific developments.

Then lastly, the DBT practices neither a political nor a technocratic TA but a social TA. In this case, in addition to involving a wide range of stakeholders to assess a technological issue, the general public has the opportunity to take part in the TA process, mainly through a set of participatory methods like the consensus conference, the citizens jury, the focus group or the scenario workshop. This methodology is practically absent from the landscapes of the previous two TA offices.

It is also helpful to stress the form of participation within the three TA offices. As we already stated, OPECST uses "OTA paradigm" participation. We also consider it to be the case for STOA, which makes use of external expertise in the evaluation process, avoiding the involvement of the public. The situation is different for DBT, which relates to what we identified as "public" participation. To put it differently, "TA practices are also dedicated to empowering democracy and to bringing together different stakeholders, including the general public, in order to broaden the base of the decision-making process and to foster a public debate by raising awareness on issues regarding the social implications of technologies" (see Section 1.3).

Lastly, to underline the meaning of the participation, we face a different situation for each TA office. In the French way of doing TA, participation means "instrumental participation". Thus, participation is used as a "consultative instrument" to reinforce the representative decision-making processes. In the case of OPECST, participation almost only amounts to involving external stakeholders in the TA process in order to boost the politicians' abilities to write the reports[6]. On the other hand, STOA is more familiar with "elitist participation". In other words, there is a dissemination of the information from scientific institutions to both politicians and the general public. Indeed, ETAG provides the policy-makers with policy options and relevant information on scientific and technological issues. Afterwards, these reports are made available to the general public through workshops and on STOA's Internet site.

[6] However, we have to mention that OPECST sometimes organises "public hearings" or press conferences in order to inform the general public. Nonetheless, even if this relates to "elitist participation", we see the French model being closer to the instrumental than to the elitist model of participation.

From the DBT side, participation means "democratic participation", especially because of the constitutional role given to the general public in assessing scientific and technological issues. Hence, in the Danish TA, the participatory methods contribute to opening up the assessment process to the general public in order to give them a significant role.

The OPECST report on "Nanosciences et progrès médical" was constructed following the "political" TA's approach. Indeed, two senators, Jean-Louis Lorrain and Daniel Raoul, were in charge of the issue and wrote the report together. They involved a broad range of external stakeholders from the worlds of academia, business, industry and research. All these scientific experts are listed at the end of the report as well as the places where the two senators went to meet some resource-persons. This way of including expertise in the TA process (without any lay/expert interaction) is related to "OTA participation". Here, like it has been underlined in our theoretical treatment of OPECST, participation is "instrumental", that is to say it is used as a consultative instrument. Based on the conclusion that nanobiotechnologies will improve human health in the future, the report makes a series of political recommendations calling for more expertise to broaden the too-narrow knowledge we nowadays have of nanotechnology without increasing the risk level for human beings and the environment. Like we mentioned above, here again we can find some elements of "elitist participation" when noticing OPECST's wish to "diffuse the future results to the broadest possible number of citizens"[7].

Regarding STOA, the report entitled "The role of Nanotechnology in Chemical Substitution" is related to the "technocratic" way of doing TA. Indeed, one member of the partnership of scientific institutions providing expertise on behalf of STOA (Dr Ulrich Fiedeler, ITAS) has been in charge of the report. Here again we recognise the so-called "OTA paradigm" participation when looking at the stakeholders involved in the TA process, coming from the worlds of industry, NGOs, academia and research.

[7] In this respect, it has to be mentioned that OPECST organised a public hearing in 2006 on "Nanotechnologies: risques potentiels, enjeux éthiques" that concluded that, whereas the ethical issues linked to nanotechnology are clearly identified, budgets allocated are very insufficient.

The methodology was divided in two parts: firstly a literature research as well as a series of interviews with experts, followed by the organisation of a workshop, where experts from different fields of nanotechnology were invited to validate the findings. Apart from the conclusion according to which nanotechnology apparently cannot contribute to an exceptionally large increase of substitution of hazardous substances, the report provides the policy-makers with a lot of concrete and relevant information in areas as diverse as coatings, flame retardants, flexibiliser, substitution of solvent, catalyst or drug targeting. When underlining the flow of information coming from the scientific sphere towards politicians and the general public, it exactly refers to what we identified as "elitist participation". Even if the ethical aspects of nanotechnology are out of the framework of this study (this way of choosing an angle to discuss nanotechnology is anyway worth noting), the recommendations call for more interaction between scientists and industry, for example through workshops or specific platforms, but the general public is still left behind whereas it is widely acknowledged that nanotechnologies may have a deep societal impact.

Finally, if we look at the DBT report on "Citizens' Attitudes towards Nanotechnology", we are confronted with what we identified as a "social TA". That is to say a TA office giving the general public an opportunity to play a pertinent role in assessing technologies. Indeed, the form of participation used for this report is not "OTA paradigm" participation any longer, but "public" participation instead. The Danish report focuses mainly on the ethical and risk-related aspects of nanotechnology, involving 29 citizens in the TA process through a set of group interviews as well as by filling a questionnaire. The point at stake was to identify the citizens' worries, hopes and fears regarding an issue for which the lay people's awareness is still very low. In this case, participation can be assimilated to what we described above as "democratic" participation, for the role given to the general public. However, this report does not particularly provide the policy-makers with scientific data on nanotechnology like it was the case for the previous two reports[8].

[8] Nonetheless, this does not mean that DBT never makes studies other than those involving citizens in the TA process. For instance, some very relevant scientific data have been provided in the framework of another study entitled "Nanotechnology and Toxicology", bringing together a wide range of experts. However, so far, both OPECST and STOA have almost systematically avoided the involvement of "lay people" in their own TA processes.

3. Conclusion

The purpose of this paper has not been to single out the best way of doing Technology Assessment, but, instead, to shed light on how differently intelligence on such a trans-boundary issue as nanotechnology can be provided and, hopefully, to encourage major organisations sharing the same "Parliamentary Technology Assessment" label to learn from each other.

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